PTO 08-1491

CC = JP
19981110
Kokai
10298854

KNIT FOR SWIMWEAR AND SWIMWEAR
[Mizugiyo amiji oyobi mizugi]

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UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. DECEMBER 2007
TRANSLATED BY: THE MCELROY TRANSLATION COMPANY

PUBLICATION COUNTRY	(19):	JP
DOCUMENT NUMBER	(11):	10298854
DOCUMENT KIND	(12):	Kokai
PUBLICATION DATE	(43):	19981110
APPLICATION NUMBER	(21):	09106191
APPLICATION DATE	(22):	19970423
INTERNATIONAL CLASSIFICATION	(51):	D 04 B 1/00
		A 41 D 7/00
		D 04 B 21/00
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TITLE	(54):	KNIT FOR SWIMWEAR AND SWIMWEAR
FOREIGN TITLE	[54A]:	Mizugiyo amiji oyobi mizugi

Claims

1. Knit for swimwear that mainly uses synthetic fiber multifilaments, characterized in that its knit part at the back surface has irregular parts with a height difference of over 0.2 mm and below 2.0 mm and the maximum value of the width of said projecting part of over 0.6 mm and below 2.2 mm at the same time, said projecting part occupies over 35% in the entire area of the back surface area, and the water retention rate at the back surface of the knit when it is wet is below 30%.

2. The knit for swimwear described in Claim 1, characterized in that said knit is a mixed knit of said synthetic fiber multifilament yarn and said polyurethane elastic yarn.

3. Swimwear characterized in that it is made of the knit for swimwear described in either one of Claims 1 and 2.

Detailed explanation of the invention

[0001]

Technical field of the invention

This invention concerns a knit for swimwear with an excellent chill-reducing performance when it is put on and swimwear with an excellent body chill-reducing performance after coming out of the water.

[0002]

Prior art

A swimsuit is sewn using a knit that has an excellent stretch so that it fits the body for the easy movement that is required for swimming. Accordingly, water is held between the body and the swimsuit when coming out of a swimming pool, and the swimsuit itself absorbs a large amount of water, and

discomfort that is accompanied by cooling of the body is felt. This tendency is especially prominent in seasons other than mid-summer.

[0003]

As an attempt for reducing the discomfort that is accompanied by chilling of the body, a knit that includes polyurethane elastic yarn or a fabric that has a water-repellent treatment provided to the entire surface of a woven fabric has been proposed in Japanese Kokai Patent Application No. Sho. 55[1980]-26243. This has the effect of preventing deterioration of the polyurethane elastic yarn by the chlorine that is contained in the pool and reducing the discomfort of chilling when it is put on because the swimwear itself does not absorb much water.

[0004]

However, when putting on a swimsuit that uses this fabric for swimming, it is difficult for the water that enters between the body and the swimsuit to pass through the fabric and escape to the outside because the entire surface of the fabric is treated with the water-repellent finish, and the water stays between the body and the swimsuit. As a result, it has a fundamental problem that it is difficult to swim and the fatigue increases.

[0005]

On the other hand, in Japanese Kokai Patent Application No. Hei 3[1991]-51312 and Japanese Kokai Utility Model No. Hei 3[1991]-14178, fibers have been proposed that contain a sunlight absorbent, for example, and a cloth that is made of them. However, they absorb the visible light and near-infrared light

of sunlight and convert them to heat for obtaining the heat insulation, and there is a disadvantage that there is no effect on cloudy days and with indoor pools where sunlight does not reach.

[0006]

Japanese Kokai Utility Model No. Hei 6 [1994]-79786 also proposes a knit that has water-repellent prints provided partially in the area of 40-90% of one side of the knit. However, a swimsuit that uses this knit has the effect of relieving the discomfort that is accompanied by the chilling of the body without preventing the water escape, but the cost required for the water repellent print processing is high, and there was an issue that it would be linked to an increase in the cost.

[0007]

Furthermore, Japanese Kokai Patent Application No. Hei 9[1997]-41244 proposes a knit for swimwear that has an irregular structure that uses a mini-pile structure and a pile structure, however, it only targeted an increase in the heat insulation when wet by providing a pile structure at the skin side.

[0008]

However, the distance between adjacent pile loops is too narrow and there are many contact points with the skin in mini-pile and regular pile structures. The pile surface also holds water well because of its loop shape, and the water retention rate at the skin side increases. Accordingly, there is a fundamental problem that the stickiness increases when worn wet, and the quick-drying performance is also very poor. There are additional problems including the wear durability, such as the generation of pilling of the pile surface, for example, and an easy separation of the pile yarn resulting from the knit structure in the pile structure, for example.

[0009]

As another method, a heat-insulating type swimsuit that is sewn from a fabric that has knit laminated at both sides of a polyurethane rubber sheet also has been marketed. Although this swimsuit also has heat-insulating performance, it has issues that include the prevention of movement because of the thick fabric, poor stretch performance, and a large metsuke, and a high cost.

[0010]

Problem to be solved by the invention

Due to these problems above, a swimsuit that not been obtained is made of a knit that possesses stretchability, metsuke, and water-escaping performance required in a swimsuit and also has excellent chill-relieving performance so that the user feels comfortable has.

[0011]

This invention, while considering the problems in the swimwear made of the knit of prior art, attempts to offer a swimwear knit and swimwear made of it that relieves the chill of the body after coming out of a pool, for example, reducing discomfort of the user, and having the stretchability and cosmetic beauty required in the fabric for in a swimsuit are also satisfied at a low cost.

[0012]

Means to solve the problem

This invention for solving said problems employs the following measure. More precisely, the swimwear knit in this invention is a knit that mainly uses synthetic fiber multifilaments, characterized in

that its knit part at the back surface has irregular parts with a height difference of over 0.2 mm and below 2.0 mm, with the maximum value of the width of said projecting part of over 0.6 mm and below 2.2 mm, said projecting part occupies over 35% of the entire area of the back surface, and the water retention rate at the back surface of the knit when it is wet is below 30%. The swimwear in this invention is characteristized in that it is made of said swimwear knit.

[0013]

Embodiment form of the invention

In this invention for a diligent examination for a swimwear knit that reduces the chill and discomfort of the body and satisfies the stretchability of the fabric and cosmetic beauty that are required in swimwear, it has been discovered that the use of a specific size for the width of said projecting part of the irregular part of the knitted part at the back surface, a specific percentage that the projecting part occupies of the total area of the back surface, and a specific water retention rate at the back surface of said knit would unexpectedly solve all of said problems.

[0014]

Synthetic fiber multifilaments that make up the knit in this invention include polyamide type, polyester type, and polypropylene type filaments, and they can be used 100% respectively or in mixed knits combining these multifilament threads.

[0015]

The filament may be in the form of raw yarn, but a desirable stretchability can be obtained when formed into a knit, and a swimsuit made of it, by providing crimp in the length direction of the filament

by providing a false twisting treatment or using polybutylene terephthalate fibers that are a highly stretchable polyester yarn.

[0016]

A further improved stretchability can also be obtained by mix-knitting the aforementioned multifilament strands together with a polyurethane elastic yarn.

[0017]

As the form of the yarn in synthetic fibers that make up the knit, multifilaments are used instead of monofilaments. When monofilaments are used, the feel on the skin will be poor, and the feel when it is put on is also poor.

[0018]

The desirable number of filaments in the multifilaments is 5-100 deniers, and the desirable single fiber titer is 0.5-10 deniers. The cross-sectional shape of the single fiber is also not particularly restricted, and round, triangular, and other modified cross-sectional shapes, for example, can be used. The thickness of the yarn is also not particularly restricted, and about 20 deniers to 150 deniers can be used desirably.

[0019]

As the type of knit, single and double circular knits that are circular knits and tricot and raschel fabrics that are warp knits all can be used.

[0020]

The knit that is used in this invention has irregular parts with a height difference of over 0.2 mm and below 2.0 mm in the knit part at its back surface. When a swimsuit is sewn and constructed in a manner so that its irregular surface will be at the skin side, the contact area between the irregular surface of the knit and the skin will decrease. Accordingly, even when the swimsuit itself contains water, there is an air layer formed between the irregular surfaces of the swimsuit and the skin, the stickiness will be reduced, and as a result the discomfort that accompanies the chill can be reduced. The height difference of the irregular surface in said knit is over 0.2 mm and below 2.0 mm. When it is less than 0.2 mm, the recessed part also easily makes contact with the skin, and there is a stickiness when the swimsuit contains water. When it exceeds 2.0 mm, there is no stickiness, but the projecting parts are too high, and the feel to the skin will be poor. An air layer is formed in the recessed part when there is a height difference in said irregular part, and a swimsuit can be obtained with a reduced chill-reducing performance even during seasons other than mid-summer by its heat insulation performance.

[0021]

A knit with the maximum value for the width of its projecting part of over 0.6 mm and below 2.2 mm is used in this invention. More precisely, the contact state with the skin will be balanced by stipulating the width of the projecting part when a swimsuit is sewn and constructed so that the projecting part will be at the skin side, and the chill-relieving performance can be further improved. When the maximum value of the width of the projecting part is less than 0.6 mm, there are too many contact points between the fabric and the skin, water is contained in gaps of the projecting parts, and will cause the chilling sensation to increase. When the maximum value of the width of the projecting part exceeds 2.2 mm, the contact area between the projecting part and the skin will be too large, and the stickiness when the

swimwear contains water indicates that there is not much difference from the flat type used in the regular product. The maximum value of the width of the projecting part here is measured in the direction at a right angle to the knitting direction regardless of the shape of the projecting part. As the shape of said irregular part, vertical stripe shapes, horizontal border shapes, checker shapes, twill shapes, herringbone twill shapes, and dot shapes, for example, can be used widely, and they are not restricted. Similarly, for the other side of the knit, flat and irregular shapes without restrictions can be used.

[0022]

For forming a height difference in an irregular form at the back surface of the knit, there are methods by knitted structures, the combination of thick yarn and thin yarn, or the combination of both, for example, and it not restricted in particular.

[0023]

The knit in this invention has the area of the projecting parts at the back surface of said knit occupying over 35%, ideally over 35% and below 80%, of the entire back surface. When this area is less than 35%, the recessed part of the swimwear also easily makes contact with the skin, the contact area between the irregular surface of the side of the swimwear toward the skin and the skin will be too large, the stickiness increases, the feel when it is put on becomes poor, and it rather extends discomfort.

[0024]

The knit used in this invention also has a water retention rate at the back surface of the wet knit of below 30%. In a wear evaluation, the chill is not felt at all when this water retention rate drops below 10%. When this water retention rate exceeds 30%, the stickiness on the contacting surface between the

projecting parts and the skin increases, and it begins to indicate a tendency for an increase in the chill and a decrease in the comfort when it is put on.

[0025]

Application examples

This invention will be explained in more detail in the application examples below. The characteristics are measured by the following methods.

[0026]

Height difference of the irregular form in the irregular part at the back surface of the knit

For the height difference of the irregular form of the irregular part at the back surface of the knit, the irregular surface of the knit is bent in vertical and horizontal directions, and the value of that bent part that is photographed using a micro-watcher (manufactured by Mitsubishi Denki K.K. (MODEL US90S)) at 50 times magnification is established to 1/50. The height of the irregularity in the vertical and horizontal directions is measured 10 times respectively, and its average value is used as the height difference.

[0027]

Concretely, it is indicated by the value of h in the model diagram of the knit cross-sectional structure in Figure 1.

[0028]

Maximum value of the width of the projecting part at the back surface of the knit

The surface of the irregular part of the knit is photographed by the aforementioned micro-watcher at 50 times magnification. The part with the maximum width of the projecting part in that photograph is measured in the direction at right angle to the knitting direction, and that value is established to 1/50. It is measured 10 times respectively, and that average value is used as the maximum value of the width of the projecting part. Concretely, it is indicated by the value of w in the model diagram of the cross-sectional structure of the knit and model diagrams of the back surface structure of the knit in Figures 1-5.

[0029]

Percentage of the area of the back surface covered by the projecting parts

The surface of the irregular surfaces of the knit is photographed by the aforementioned micro-watcher at 50 times magnification, and the area of the projecting parts relative to the total area is measured by tracing the area of the projecting parts with a digital planimeter manufactured Uchida K.K. (KP-90) in the photograph. That proportion is indicated by the percentage.

[0030]

Water retention rate of the irregular surface in the knit

The weight of a 10 cm x 10 cm evaluation sample (E) is measured, soaked in distilled water, the sample is taken out, and it is mounted over a glass plate with the irregular surface of the sample facing down. One sheet of 10 cm x 10 cm blotting paper is placed at the upper side of the sample, left with a 5 g/cm^2 load for 10 seconds, and the weight of the knit (E1) is measured. The wet sample is afterward held

by 10 cm x 10 cm blotting paper at both sides, left with a load of 5 g/cm^2 for 60 seconds, and the water content detected from the respective front and back surfaces of the knit is calculated by the increase in the weight in the respective blotting paper sheets placed at both surfaces. The water retention rate on the irregular surfaces of the knit G (%) is obtained by the following equation when the water content detected from the irregular surfaces of the knit is F, and it is indicated by the average value of 3 sheets.

[0031]

Water retention rate on the irregular surfaces G (%) = {F/(E1 - E)} x 100

This is the evaluation method assuming the state when the user comes out of a swimming pool and water drops from the swimsuit are shaken off. As this water retention rate on the irregular surfaces G(%) becomes smaller, that indicates that the chill to the body is less and the swimsuit is more comfortable when it is put on.

[0032]

About the wear evaluation and the comprehensive evaluation

The standards for 'feel to the skin' stickiness when coming out of water 'cold sensation', and 'comprehensive evaluation' of the irregular parts at the skin side when it is put on are indicated next.

[0033]

(1) 'Feel to the skin' at the skin side (irregular parts):

⊙: 'feel to the skin' is extremely good, ○: 'feel to the skin' is good, X: 'feel to the skin' is poor.

(2) 'Stickiness after coming out of the water':

⊙: there is no 'stickiness' at all, ○: there is almost no 'stickiness', Δ: There is a little 'stickiness', X: it is extremely 'sticky'.

(3) 'Cold sensation':

⊙: Cold sensation is not felt, ○: Almost no cold sensation is felt, Δ: Cold sensation is slightly felt, X: Cold sensation is felt.

(4) 'Comprehensive evaluation':

⊙: It is extremely excellent as a chill reducing type swimsuit, ○: It is suitable as a chill reducing type swimsuit, X: It is not suitable as a chill reducing type swimsuit.

Application Example 1

Using a type of polybutylene terephthalate fibers of polyester filament 'tetron' manufactured by Toray K.K., it is knitted in 3 reeds by a 28-gauge single tricot machine by arranging 50-denier 24-filament yarn for the front and middle reeds and 30-denier 12-filament yarn for the back reed. As a result, a knit with a height difference of the stripe form irregularity at the back surface as indicated in the model diagram in Figure 2 is obtained. One side of this knit is flat.

[0034]

In accordance with the dye processing conditions for general polyester knits, boiling off, dye, and finish setting are then performed, and a knit with 172 g/m^2 metsuke is obtained.

[0035]

This knit has a height difference h of the irregular part of 0.56 mm, the maximum value w of the width of the projecting part of 1.13 mm, and the surface ratio of the projecting part of 43.8%. The water retention rate of the irregular surface of the fabric is 12.0%.

[0036]

A test swimsuit is prepared using this knit in a manner such that the irregular surface will be at the skin side, and provided to a wear evaluation in late June by 8 female testers in an indoor pool. As a result, the feel to the skin by the height difference in the irregular form and the maximum value of the width of the projecting part arranged at the back surface of the swimsuit was not problematic. Stickiness and cold sensation, for example, were not also problematic at all, and the wear comfort after coming out of the pool was also excellent. Table 1 shows their evaluation results.

[0037]

Application Example 2

Using 100% false twist processed yarn of nylon filament (50 denier, 17 filaments) manufactured by Toray K.K., it is knitted in a 28-gauge jacquard structure by a both-surface circular knitting machine, and a knit with a height difference of the checker form irregularity at the back surface as indicated Figure 3 is obtained. One side of this knit is flat.

[0038]

In accordance with the dye processing conditions for general polyester knits, boiling off, dye, and finish setting are then performed th 154 /m^2 metsuke is obtained.

[0039]

This knit has a height difference h of the irregular part of 0.22 mm, the maximum value w of the width of the projecting part of 0.64 mm, and the surface ratio of the projecting part of 36.2%. The water retention rate of the irregular surface of the fabric is also 28.6%.

[0040]

A test swimsuit is prepared using this knit in a manner such that the irregular parts will be at the skin side as in Application Example 1, and provided to an actual wear evaluation, and there were no problems in the results. Table 1 also shows the evaluation results.

Application Example 3

Using regular polyester filament 'Tetron' manufactured by Toray K.K. (50 denier 24 filaments) and polyurethane elastic yarn 'Operon' manufactured by Tore DuPont K.K. (registered trademark, 40 deniers), it is knitted in 3 reeds by a 28-gauge single tricot machine by arranging Tetron yarn for the front and middle reeds and operon yarn for the back reed. The mixing ratio of the respective filaments is 40% for the front reed, 40% for the middle reed, and 20% for the back reed, and a knit with a height difference in the wavy stripe form irregularity at the back surface as indicated in Figure 5 is obtained. One side of this knit is flat.

[0041]

In accordance with the dye processing conditions for regular polyester and polyurethane elastic yarn mixed woven knits, boiling off, dye, and finish setting are then performed for dye processing, and as a

result, a knit with 184 g/m^2 metsuke is obtained. This knit has a height difference h of the irregular part of 1.86 mm, the maximum value w of the width of the projecting part of 2.18 mm, and the area of the projecting part of 52.3%. The water retention rate of the irregular surfaces of the fabric is also 9.4%.

[0042]

A test swimsuit is prepared using this knit in a manner such that the irregular part will be at the skin side as in Application Example 1, and provided to an actual wear evaluation, and there were no problems in the results. Table 1 also shows the evaluation results.

[0043]

Comparison Example 1

Using the same polyester filament 'Tetron' manufactured by Toray K.K. as in Application Example 1, it is knitted in 2 reeds by a 28-gauge single tricot machine by arranging 50-denier 24-filament yarn for the front reed and 30-denier 12-filament yarn for the back reed. The mixing ratio of the respective filaments is 80% for the front and 20% for the back, and a fabric with a front and back flat structure as indicated in Figure 4 is obtained. This is a half-structure that is generally used for swimwear.

[0044]

As a result of the same dye processing as in Application Example 1, a knit with 142 g/m^2 metsuke is obtained. This knit also has a height difference h of the irregular part of 0.04 mm, and the maximum value of the width of the projecting part and the area of the projecting parts were not clearly detected because it was almost flat. The water retention rate at the back surface of the fabric is also 54.0%.

[0045]

A test swimsuit is prepared using this knit as in Application Example 1 and provided to a practical wear evaluation. In the results, the feel to the skin was not that problematic because the swimsuit contacted too close to the skin and the water retention rate of the swimsuit at skin side was too high, but the stickiness and cold sensation were felt strongly, and the feel when it was put on was poor. Table 1 also shows the evaluation results.

[0046]

Comparison Example 2

Using the same yarn as in Application Example 1 and knitting by the same tricot machine, a fabric indicated in Figure 2 with a height difference of the stripe form irregularity at the back surface is obtained. One side of this knit is also flat.

[0047]

As a result of the same dye processing as in Application Example 1, a knit with 168 g/m^2 metsuke is obtained. This knit has a height difference h of the irregular part of 2.45 mm, the maximum value w of the width of the projecting part of 1.35 mm, and the area of the projecting part of 32.3%. The water retention rate on the irregular surfaces is also 22.7%.

[0048]

A test swimsuit is prepared using this knit similar to Application Example 1 and provided to a practical wear evaluation. The stickiness was not problematic, but the feel to the skin was poor because

the height difference of the projecting part at the skin side was too high. Table 1 also shows the evaluation results.

[0049]

Comparison Example 3

Using the same yarn as in Application Example 2 and in the jacquard structure by a both-surface circular knitting machine, a fabric indicated in Figure 3 with a height difference of the checker form irregularity at back surface is obtained.

[0050]

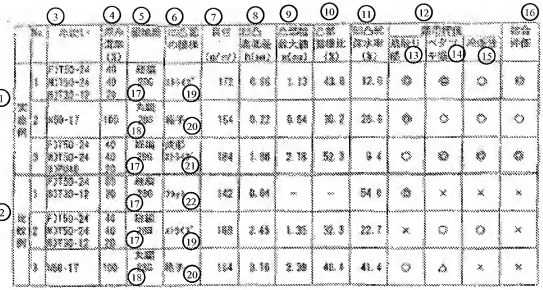
As a result of the same dye processing as in Application Example 2, a knit with 164 g/m^2 metsuke is obtained. This knit has a height difference h of the irregular part of 0.16 mm, the maximum value w of the width of the projecting part of 2.39 mm, and the area of the projecting part of 40.4%. The water retention rate of the irregular surface of the fabric is also 41.4%.

[0051]

A test swimsuit is prepared using this knit similar to Application Example 1 and provided to a practical wear evaluation. Although the feel to the skin was not problematic, the height difference in the irregularity part and the maximum value of the width of the projecting part were too large, which increased the retention rate in that part, and the stickiness and cold sensation were poor. Table 1 also shows the evaluation results.

[0052]

TABLE 1



In the yarn that is used, F: front yarn, M: middle yarn, B: back yarn, T: polyester yarn, N: nylon yarn, and PU: polyurethane yarn.

Key: 1 Application example

2 Comparison example

3 Yarn that is used

4 Mixing ratio of material yarn

5 Knit structure

6 Pattern of irregular surfaces

7 Metsuke (g/m^2)

8 Height difference of irregularity h (mm)

9 Maximum value of the width of the projecting part w (mm)

10 Area of the projecting part (%)

11 Water retention rate of the irregular part (%)

12 Wear evaluation

13 Feel to the skin

14 Stickiness

15 Cold feel

16 Comprehensive evaluations

17 Warp knit 28G

18 Circular knit 28G

19 Stripe

20 Checker

21 Wavy stripe

22 Flat

[0053]

Effect of the invention

This invention can offer a swimwear knit that has excellent comfort when put on as a swimsuit in that the chill that accompanies the stickiness when coming out of water is reduced, as well as having excellent practicality including easy movement, for example, and said knit can be satisfactorily used in a wide range of swimwear including school swimsuits, fitness swimsuits, swimsuits for leisure swimming, and swimsuits for rehabilitation, for example. /6

Brief description of the figures

Figure 1 is a model diagram of a cross-sectional structure of the knit in this invention.

Figure 2 is a model diagram of the back surface structure of the knit in Application Example 1 and Comparison Example 2 in this invention.

Figure 3 is a model diagram of the back surface structure of the knit in Application Example 2 and Comparison Example 3 in this invention.

Figure 4 is a model diagram of the back surface structure of the knit in Comparison Example 1 in this invention.

Figure 5 is a model diagram of the back surface structure of the knit in Application Example 3 in this invention.

Explanation of symbols

a: Threads that form the surface of the knit

b: Threads that form the projecting part at the back surface of the knit

c: Threads that form the recessed part at the back surface of the knit

h: Height difference of the irregular part at the back surface of the knit

w: Maximum value of the width of the projecting part at the back surface of the knit

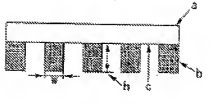


Figure 1

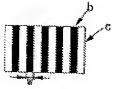


Figure 2

Figure 3

Figure 4

Figure 5